Optics detailed analysis of an improved collimation system for LED light sources.

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Abstract. Throughout present study will be discusses the influence of the manufacturing margins, adjustment precision and ray model accuracy of a collimating LED unit in the overall system performance. It will be also analyzed the angular performance and the collimated in relation to the relative position of the LED and the collimator's dimensions. Finally the results will be compared with existing publications in this field.

Analytical approach.

This study will test the performance of a LED collimator for different types of source angular misalignment and displacements of the same. The design of the LED collimator is planned for a real LED source; optics design have a important methodological constrain [1-4]: in order to solve a problem it is necessary to determine the geometry and the materials will be used for that and then we can verify if that solution that we had though, were right enough taking into account tolerances, cost, suppliers and a lot of different constraints. When a optics model of the a collimator is developed usually at the beginning steps of the design process a perfect model is used: at beginning as a point source and after as a lambertiam area source. These models are far away of the final result. When with these simple concepts the optics concept is defined, after the shape and materials is decided is possible to start with the simulation. At this phase the first problem must be faced involves a virtual LED model which dimensions are bigger than the actual real source. This could imply if the first surface is closer than ray trace model origin it could imply a big error since the first refraction will not take place. In the case studied in this work it would not be very important due to the first surface is perpendicular to the propagation direction. If the scale of the optic unit would be scaled we would be changing the real source size and it would imply an error with the model since the effect of the size will be lower than real case.

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